SUMMARY REPORT
Energy Analysis Forum

"Understanding State and Regional Electricity Markets: Analytic Issues for Efficiency and Renewable Energy"

Golden, Colorado (November 9-10, 2004)

Introduction

The 2004 Energy Analysis Forum addressed information and analysis issues relating to the adoption of renewable energy (RE) and energy efficiency (EE) technologies in today's energy markets, focusing on electricity markets at the state and regional level. The forum – sponsored by the National Renewable Energy Laboratory (NREL) and organized by NREL's Energy Analysis Office (EAO) – attracted nearly 90 people to Colorado, including representatives from state and regional energy offices, environmental organizations, the energy industry, academia, government agencies, and energy analysts. This was the fourth in a series of energy analysis forums initiated by NREL to address energy information and analysis important to the nation's energy efficiency and renewable energy programs and technologies.

The forum organized information and analysis issues into four categories:

- **Financial** issues – examples include economic analysis tools, investment instruments, benefits analysis
- **Market** issues – examples include market analysis, deliberative polling, certificate markets
- **Policy** issues – including perspectives from legislators, regulators, and energy planners
- **Technology** issues – examples include system attributes of energy efficiency, wind, and PV, emerging control technologies

The purpose of the forum was to provide both a brief summary of current knowledge of these issues and to identify what additional information or analysis is needed to improve our understanding of these issues. The forum organization and focus is summarized in the following table. A complete forum agenda is attached as **Appendix A.**

Day 1		Day 2
Presentations and discussions on • Market issues • Financial issues • Policy issues • Technology issues Evening reception and poster session on energy models		• Summaries of Day 1 presentations and discussions • Working Groups in the four topic areas • Summaries of information and analysis needs

Key Forum Questions

- What are the analysis or information barriers to increasing development of state and regional electricity markets for renewable energy and energy efficiency technologies?
- What additional analysis data, information, and/or tools, are needed to improve our understanding of these barriers and the affected markets?

Brief Summaries of Presentations and Discussions

This report provides only brief summaries of key points made by forum speakers and participants during the presentation and discussion sessions on Day 1. Additional details can be found in the full presentations, which are available at http://www.nrel.gov/analysis/forum/presentations_04.html

Keynote Presentations

The highlight of the forum's opening session was a keynote speech from Maine State Treasurer **Dale McCormick**. She spoke about addressing climate change risk in corporate disclosures and the state treasurers' green initiative (a joint effort with the treasurer of Vermont), which seeks to mitigate investment risk by including renewable energy in the investment portfolios of state pension funds. She also suggested that PUCs (public utility commissions) should consider requirements for assessing climate change risks of utilities under their jurisdiction. McCormick posed several issues deserving scrutiny, including analysis of

- The costs to American firms of specific climate change proposals such as the Kyoto Protocol or the McCain-Lieberman bill,
- The effect of alternative energy technologies on the costs of reducing carbon emissions,
- ROI (return on investment) results for "environmentally managed" firms vs. others, and
- The right level of investments in alternative energy or environmental securities to provide a hedge against environmental or climate change risk in portfolios.

Martin Whittaker, a senior vice president and environmental specialist for Swiss Re Financial Services Corporation, gave a second keynote address. He spoke about the risk that climate change represents for the insurance industry and steps that Swiss Re is taking

to mitigate those risks. In addition to hedging those risks by investments in firms likely to benefit from environmental or climate change regulations, Martin outlined concepts for developing new investment instruments such as long-term purchases of RECs (renewable energy certificates).

Market Issues Presentations and Discussion

- Market drivers need to be analyzed and studied. These factors include state renewable portfolio standard (RPS) regulations, risk mitigation and resource diversity (price, environmental), economic development, and consumer demand.
- Consumer preference needs to be better understood. While consumers generally support greater use of EE and RE, there is less understanding of what helps convert consumer awareness of a "good idea" to a purchase decision.
- Information on renewable energy certificates (RECs) needs to be heightened.
- EECs (energy efficiency certificates) should be developed.
- Decision makers are interested in knowing the emissions benefits, so we need to develop methodologies and estimates that are transparent, easy to use, widely accepted, and publicly available.
- It's also important to determine how to offer a price stability benefit in a REC product and to study whether a fragmented market is being created.

Financial Issues Presentations and Discussion

- We need to know the consumers and what key factors affect their decisions. For instance, what type of information do they need and what types of supporting structures need to be developed and implemented.
- Decision makers need targeted information on specific issues/benefits. Specific areas include benefits analyses, technology costs, economic data and analysis, intermittency, and lessons learned. These decision makers are interested in a "one-stop shop" for information.
- On the business side, it is critical to determine the scenario that will persuade utilities to get more involved in renewable energy investments (large and small RE systems, and EE strategies) and to know how these investments can become more attractive (or profitable) for utilities. We need to supply information on the differences between regulated and restructured markets, and also provide risk/return tradeoff analysis in utility resource planning.
- Collaborative efforts between national labs and state groups will help strengthen analysis direction and ensure that the information meets the specific needs. It was noted that personnel resources are key to this goal.
- Financial engineering tools, such as project finance "assistance," were noted as a need. Fossil plant analysis tools, and what should be included in these tools, are an identified need for decision and policy makers.
- Financial considerations of renewable portfolio standards also need to be evaluated. Decision makers want to know the appropriate level, counting methods, costs, and benefits.
- Decision makers need to know the value attributes of RE and EE options. Analysis targets would include hedging vs. fuel-price fluctuations, security, option value and

the full costs and benefits of RE and EE investments, including cash flows, value of in-state systems, environmental impacts, economic development impacts, etc.
- Up-to-date characterizations of the costs and performance of RE and EE technologies are needed

Policy Issues Presentations and Discussion

- Analysis of rate-making solutions is needed; including addressing factors such as decoupling sales from profits and maintaining unit-based pricing.
- Transmission issues are both influenced by and influence policy. Analysis of the full range of technology and operation issues is needed.
- Modeling energy, the environment, and the economy will help decision makers with big-picture decisions.
- Broadly accepted technology characterizations for RE and EE technologies including costs, performance capacity factors, environmental characteristics, etc. is needed.
- Providing decision makers with easy access to analysis results in a format that is understandable to them is critical.

Technology Issues Presentations and Discussion

- Information on intermittency, including impact of wind on operational costs, standardization/validation in production cost models, and capacity values will help determine technology direction.
- A key area needing further analysis is transmission. Desired information includes availability of existing lines, new transmission technologies, standard models and assumptions, and the distribution system value of distributed generation.
- Information on technology and application characterization is a vital need.
- Impacts of future technologies, including Internet data, communication, and control; plug-in hybrid electric vehicles; and "nano" technologies may have major implications for the development and deployment of RE and EE technologies in the future.
- Better rate structures will produce better ratepayer investments
- Identification and adoption of policy metrics will increase policy effectiveness
- Another critical need is value analysis, including peak reduction, reliability, and security.
- Decision makers require validation of benefits and outreach information.

Results from Working Group Sessions

In order to enable participants to more actively and intensively engage in forum deliberations, participants were divided into four Working Groups to discuss the key issues presented during the forum. These Working Groups were asked to focus on this primary question:

What additional data, information, and analysis are needed?

In addition, each of the groups – Market, Financial, Policy, and Technology – were invited to comment on the following information and analysis questions:

- What's the strategy for developing it?
- How do we better communicate the understanding we have?
- Does what we've discussed have any program or policy implications?

We have developed a short summary of the Working Group results in the table below. The full reports from the Working Group sessions are available at http://www.nrel.gov/analysis/forum/presentations_04.html

WORKING GROUP PRIORITIES

Financial	Market	Policy	Technology
Economic cost and benefit analysis, including risk	Understanding customer segments and drivers	Compile and report success stories	Models for intermittency that capture ancillary services and capacity value
Analysis of current state and federal policies	Develop effective marketing approaches for each segment	Consolidate info on RE and EE policies into easily accessible and understandable documents	Distribution system value of distributed resources
Distributed resources cost and value analysis	Standardization of RECs	Data collection and analysis of Western transmission utilization	Updated technology characterizations
Analysis, improvements for utility decision tools	Develop accepted tools and methodologies for benefits analysis	Wind-firming options	Analysis of avoided emissions on the grid
Performance, cost, O&M data on past projects	Educate utilities regarding latest technologies and their value	RE models with regional resource, transmission, and load representation	Analysis of integrated systems, e.g. grid with hybrid vehicles, water impacts
Regulatory uncertainty analysis	Representation of EE and RE in public models with regional, economic, and risk capabilities	Framework for consideration of RECs by municipal utilities	Evolution of electric systems with addition of RE and EE systems
Streamlined tools for small project analysis		Modeling of energy, environment, economic policy implications and interactions.	Availability, utilization of transmission lines
EE and RE impacts on loans and resale value			
Analysis of fixed or collared RE-based electricity products			

Forum Recommendations

We have developed a shorter list of high-priority recommendations based on the forum discussions. These were extracted from both the presentation and panel sessions, and from the Working Group results. We invite comments from participants who have improvements to offer, as well as continued discussions on how to move forward on these recommendations. Please e-mail energy_analysis@nrel.gov with your feedback.

- Analysis and reporting of cost, performance, and O&M information from installed RE and EE systems
- Updated technology characterizations for projecting RE and EE systems' costs, performance, and environmental characteristics.
- Benefits analysis, including improved tools for projecting EE and RE economic, environmental, and risk benefits
- Analysis of distributed resources, including operating characteristics and value analysis
- Improved representation of EE and RE systems in major energy models, including regional resource, transmission, and load representation
- Analysis of utilization of transmission systems
- Analysis of the costs and benefits of current state and federal EE and RE policies
- Integration and dissemination of results of studies into formats tailored for users
- Clarification of REC attributes and standardization of REC markets
- Development of energy efficiency certificates (EECs or "white certificates")

APPENDIX A – FINAL AGENDA

Forum Purpose: Participants at this two-day event will discuss critical issues relating to the development of markets for renewable energy and energy efficiency technologies. The forum will focus on state and regional electricity markets, with an emphasis on policy issues, financing, and market opportunities and barriers. It will summarize what is known, as well as identify the data and analysis needed to improve understanding of this issue.

7:30 – 8:00	Registration and continental breakfast	

Session I - Introduction

8:00 – 8:15	Welcome to the forum	***Bobi Garrett, NREL Associate Director***
8:15 – 8:30	Forum purpose	***Eldon Boes, NREL***
8:30 – 9:00	Keynote: "Treasurers' Green Initiative"	***Dale McCormick, Maine State Treasurer***

Session II – Development of state and regional electricity markets for renewable energy and energy efficiency technologies

Session II.A – Market issues

9:00 – 9:10	Session introduction	***Blair Swezey, NREL, chair***
9:10 – 9:25	"Consumer Research on EE and RE"	***Steve French, Natural Marketing Institute***
9:25 – 9:40	"Deliberative Polling – Process and Results"	***Frank Thompson, Nebraska Energy Office***
9:40 – 9:55	"California's Market for Renewable Energy"	***Marwan Masri, California Energy Commission***
9:55 – 10:10	"REC/EE Certificate Markets"	***Meredith Wingate, Center for Resource Solutions***
10:10 – 10:30	Discussion period	***Panel and Audience***

10:30 – 10:45 Break

Session II.B – Financial issues

10:45 – 10:55	Session introduction	***Doug Arent, NREL, chair***
10:55 – 11:10	"Using Long-Term REC Contracts to Help Developers Secure Project Financing"	***Karlynn Cory, Mass. Tech. Collaborative***
11:10 – 11:25	"Hedge Value of Renewable Energy"	***Ryan Wiser, LBNL***

11:25 – 11:40	"Rural Economic Analysis"	***Jennifer Moehlmann, Iowa Energy Office***
11:40 – 11:55	"Potential Impacts of an Advanced Energy Portfolio Standard in Pennsylvania"	***Ryan Pletka, Black and Veatch***
11:55 – 12:15	Discussion period	***Panel and Audience***
12:15 – 1:15	***Working lunch – Martin Whittaker, Sr. VP Environmental Solutions, Swiss Re***	

Session II.C – Policy issues

1:15 – 1:25	Session introduction	***Roya Stanley, NREL, chair***
1:25 – 1:40	"Key Issues in Developing Policy for RE and EE – A Legislator's Perspective"	***Matthew Brown, NCSL***
1:40 – 1:55	"Key Issues for Developing RE and EE – The Regulators' Perspective"	***Rick Weston, RAP***
1:55 – 2:10	"Developing a Regional Energy Planning Framework for the Northeast States"	***Gary Kleiman, NESCAUM***
2:10 – 2:25	"Challenges in Reaching the Western Governors' Association Goal for Renewable Energy"	***Doug Larson, WIEB***
2:25 – 2:45	Discussion period	***Panel and Audience***
2:45 – 3:00	***Break***	

Session II.D – Technology issues

3:00 – 3:10	Session introduction	***Walter Short, NREL, chair***
3:10 – 3:25	"Maximizing Wind on the Grid"	***Ron Lehr, AWEA***
3:25 – 3:40	"Internet-Based Control for Energy Management"	***Jack McGowan, Energy Control Inc.***
3:40 – 3:55	"Using PV to Shave Peak/Grid Security"	***Christy Herig, consultant***
3:55 – 4:10	"EE Technologies' Cost-Effective Integration into Buildings – A Utility's View"	***Roger Duncan, Austin Municipal Utility***
4:10 – 4:30	Discussion period	***Panel and Audience***
4:30 – 5:00	***Discussion period – Day One***	***Session Chairs/Audience***
5:00 – 7:30	**Reception at hotel – including poster session**	

********** End of Day One **********

***Session II.E* – Summary of issues for the state and regional electricity markets and discussion of analytical framework.**

8:00 – 8:15	Market Group summary/discussion	***Blair Swezey, NREL***
8:15 – 8:30	Financial Group summary/discussion	***Doug Arent, NREL***
8:30 – 8:45	Policy Group summary/discussion	***Roya Stanley, NREL***
8:45 – 9:00	Technology Group summary/discussion	***Walter Short, NREL***
9:00 – 9:15	Working Group instructions	***Eldon Boes, NREL***

Session III – Improving Our Understanding - what additional data, information, and analysis is needed?

- What's the strategy for developing it?
- How do we better communicate the understanding we have?
- Does what we've discussed have any program or policy implications?

(These topics to be addressed by topical Working Groups)

9:15 – 11:30 **Working groups meet**

A. **Market** – Blair Swezey
B. **Financial –** Doug Arent
C. **Policy –** Roya Stanley
D. **Technology –** Walter Short

11:30 – 12:30 Working lunch

12:30 – 2:00 Working Group reports

2:00 – 3:00 Facilitated discussion ***Eldon Boes, NREL***

********** **Forum closing at 3:00 p.m.** **********